Wetland Management and Protection

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Wetlands are dynamic systems that change through time. This change is normal and expected. These changes can be dramatic or slow and unnoticeable. For example, streams and rivers are subjected to continual disturbance from rainfall because spring floods or summer drought can change flow rates and volume. New stream channels may be cut, leaving old channels to dry up or become oxbow lakes. Increased flows can cause erosion. The subsequent sediment load from erosion is deposited at other points downstream when the current slows. On a seasonal basis, adjacent floodplain bottomland hardwood systems contend with disturbance when water overflows their banks.

At the other end of the spectrum, wetland change may occur so slowly in ponds, marshes, and swamps that it appears unnoticeable over a single human lifetime. However, the processes of sedimentation and organic deposition are constantly at work. Over time, ponds and lakes slowly fill up to the point where they become swamps. These in turn become bogs. Ultimately, over a great span of years, they turn into beds of peat or coal.

Wetland change is a natural process, and when we talk about protecting wetlands we are really protecting them from human impact. This protection is important so that they may continue to function as natural systems. Agriculture has the greatest negative impact on South Carolina's wetlands; development is second. However, wetland destruction has been happening since early periods in human history.

History of Wetland Destruction

Since wetland soils contain many stored nutrients, farmers have long been devising ways to drain them so they could grow crops. The first recorded dam was constructed more than 5,000 years ago in Egypt. However, it was the ancient Romans who were first to leave extensive records of wetland draining methods. This knowledge was carried by their legions to the farthest corners of the Roman Empire. For example, levees and channels dating from about A.D. 60 may still be seen in the southern districts of Great Britain. While a number of these ancient structures are still in use, nature has reclaimed many more.

History looks benevolently upon the Dutch engineers who created the system of dikes that reclaimed land from the North Sea. We forget that a tremendous loss of wetlands took place with the completion of this feat. The impacts on waterfowl and North Sea fisheries are only today being recognized by European ecologists.

In the New World, drainage modifications began almost as soon as the colonists came ashore. The descendants of the Pilgrims began filling Boston Harbor in the 1680s, and the French completed the first man-made levee on the Mississippi River in 1727. In the 1780s, it is estimated there were 221 million acres of wetlands in the lower 48 states. Today an estimated 104 million acres remain. Similarly, in South Carolina, an estimated 6.4 million acres of wetlands in 1780 have been reduced to 4.6 million acres. This represents a loss of around 1.8 million acres in 200 years. Floodplains were drained for agriculture, and streams were dammed to provide power for grist mills, saw mills and hydroelectric plants.

Since nature has a way of reclaiming lands that are not attended to, many small drainage projects completed around the turn of the century have fallen into disuse and proven unsuccessful in the long run. Sedimentation has clogged drainage tiles and choked channels. Flooding has washed out dams and levees. A decline in trapping has led to increased numbers of beavers and muskrats. Beavers build dams where they are not wanted, and muskrats excavate tunnels in man-made dams and levees, causing leakage. These activities compound problems created by small drainage projects.

The failure of these small projects has resulted in the initiation of larger projects. Many of these large projects were implemented under the auspices of the old USDA Soil Conservation Service, now the Natural Resources Conservation Service (NRCS), and the Corps of Engineers during the 1950s and 60s. These large projects were only partly successful and often not cost-effective. They created cropland which is workable only intermittently. These projects have often been detrimental to both agriculture and the environment. This is especially true when the cost of increased downstream flooding plus the loss of functioning wetlands and wildlife habitat is added to the already high cost of these drainage and flood control projects.

Man's Impact on Wetlands

Farming has often been unfavorable to wetlands. As previously mentioned, South Carolina has lost more than 28 percent of its wetlands. Most of this loss is due to agriculture and development.

In the past, farmers, who worked to make a living off the land, ditched or tiled fields to get water off these areas earlier. Farmers also attempted to plow and crop wetlands during drought years. Over the short term, these efforts may be successful. As often as not, these efforts

fail because wetlands can and do dry up; however, they sooner or later get wet again. As a result, a farmer may increase yields for a season or two, but at the expense of the destruction of valuable wildlife habitat.

In the past, many farmers battled natural vegetation that competed with crops and did anything to rid themselves of it, often with long-term, detrimental results. Natural riparian (streamside) vegetation comprised of water-tolerant trees, shrubs, and herbaceous plants tends to stabilize stream banks. Woody root systems physically support stream banks and slow the actions of undercutting and stream bank collapse. When streams overflow, the thick mass of vegetation acts as a filter for suspended solids. It also tends to slow fast moving waters, which further reduces erosion.

On the surface it would seem that replacing riparian vegetation with grassland and letting cattle graze there would not be a problem. In practice, it can cause problems. Cattle cause stream banks to deteriorate just because of their weight. When high water occurs, the grass (especially when heavily grazed) is unable to protect streams from erosion. Cattle also deposit manure directly into streams, leading to other problems. All of these factors necessitate that cattle should be kept out of streams and other wetlands.

Farmers may cause a loss of wetlands by overfertilizing crops. Excess nitrates and other soil fertilizers do not lead to bigger and better crops. They do lead to increased nutrient runoff, which is a leading cause of non-point source pollution of wetlands and local groundwater supplies (not to mention a waste of money). Taking a soil test and following the recommendations of a soil scientist can do much to alleviate this pollution. In the same fashion, using only recommended amounts of pesticides will keep costs down and reduce pollution of adjacent waterways.

Wetlands and Development

Agriculture is not the only culprit when it comes to wetland destruction. Development also negatively affects wetland ecosystems. Commercial development has taken its toll on South Carolina's wetlands. It is not surprising that most of the state's metropolitan areas are located along river systems or wetlands.

Urban development in coastal areas such as Beaufort, Hilton Head, Charleston, Georgetown and Myrtle Beach have destroyed many wetland areas. As an example, in Charleston on the peninsula section of town, a significant area is filled-in salt marsh. Much of this was done in the 1700s. In addition, many of the "upland" areas of the city were former wetlands that have been paved. With so much of this area paved and so little wetland left to absorb rainfall runoff, it is little wonder that certain sections of the city have flooding problems nearly every time it rains.

Wetlands Management

A more progressive view of wetlands is beginning to emerge as the benefits of these areas become more widely known. Landowners want information on protection and management of their natural resources. The following discussion focuses on some of the basic methods and techniques that have proven successful for wetland management.

A wetlands management plan should consider the following:

1. *Inventory* – What sort of wetland is targeted for management? A marsh, a bottomland hardwood forest, streamside riparian vegetation, a pond or lake? Does the landowner own or control the areas of water inflow and outflow? Determine the wetland location in relation to other areas that will be managed. Consider the size of the wetland and its condition. All of these factors will help to determine if the proposed goals for the wetland are realistic, and what management strategies are needed to attain these goals.
2. *Management Considerations* – How will the area be used? Recreation, wintering waterfowl habitat, a wildlife sanctuary? Time factors should also be considered. Is this a permanent project, or is it subject to change because of government programs or other factors?
3. *Management Goals* – These can be relatively simple, such as protection of an existing site, or relatively complex, such as complete wetland restoration. Other wildlife management goals should also be considered. Will the landowner be managing for a particular wildlife species, or simply wishing to enhance the wetland to make it more suitable for all wildlife?

Managing Wetlands for Wildlife

Wetland wildlife management can be as simple as doing nothing. It can also be quite complex where water levels are manipulated seasonally to provide optimal food and cover for waterfowl and other wetland wildlife species. One cost-effective method of enhancing wetlands on farmland is to remove grazing livestock from stream, pond, and marsh edges. Natural vegetation will soon take over along the water's edge. This provides both food and cover for wildlife in the riparian vegetation zone. This riparian edge provides excellent habitat for both wetland and terrestrial species. Frogs, turtles, snakes, mice, muskrats, beavers, mink, raccoons, foxes, and deer, to name a few, all use this riparian habitat. If the landowner chooses, it is possible to accelerate the natural process of plant regeneration along ponds and streams by hand or mechanical planting. Cost-sharing assistance is available for both of these options though the local USDA NRCS office. Another advantage is that it ensures certain desirable species will be present in the habitat. However, this adds greatly to the cost of development, both in plant material costs and labor, as opposed to allowing these areas to come up naturally in native vegetation. If the landowner wishes to pursue this option, he should contact the local USDA NRCS office for technical guidance on choosing the correct plantings for a given site.

Moist Soil Management

In South Carolina, natural wetland systems, such as bottomland hardwood forests and their associated wetlands and moist meadows, are normally flooded during the late fall and winter. The irregular topography, plus varying water levels, provides for diversity in these

wetlands. This is important because different species of wildlife are adapted to using different water depths. For example, most dabbling ducks and Canada geese prefer feeding in water depths of 4 to 18 inches; whereas, coots and diving ducks prefer feeding in water depths of about 20 inches. Since these wetland areas are not flooded during the growing season, plants that wildlife use for food and cover are allowed to grow. Seeds from these plants are available to migrating or wintering waterfowl and other wildlife species when the land is flooded again during the fall. When natural wetland systems are drained or damaged, this seasonal habitat is lost. At a minimum, these habitats may not be as productive when compared to unaltered systems. At this stage, wildlife managers should step in and restore the original system or attempt to duplicate the functions of the natural system. When managers attempt to duplicate the function of these natural systems, it is called **moist soil management.**

Moist soil management has proven to be one of the most productive wetland management methods because it duplicates and enhances natural processes. Moist soil management is accomplished by maintaining the water level in wetlands at optimal levels throughout the year. The key to providing abundant food for wintering waterfowl and other wildlife species is water level management. Water level management is achieved by placing water-control structures at the outlet of a water impoundment. This allows the manager to fine-tune the optimal depth of water for any particular wildlife species at the appropriate times during the seasons.

The basic strategy is to draw down the water level in early spring and allow preferred weeds to grow. Preferred foods for waterfowl include smartweeds, wild millet, pond weeds, arrowhead, bulrushes, sedges, and rushes. These plants grow from seed each year on bare soil and are encouraged to germinate when competition from perennial plants is reduced by flooding at the proper time. Once these plants have produced seed, the area is reflooded in late summer or early fall to allow waterfowl easy access to the flooded food plants. The following discussion illustrates how a given wetland impoundment might be manipulated for wildlife, particularly waterfowl, during a given year.

Moist Soil Management: Fall Flooding

During the fall and winter months the primary users of wetland impoundments are waterfowl. In South Carolina, these impoundments provide shallow water conditions suited to most dabbling ducks. Shallow water areas are also attractive to other wildlife species. As mentioned earlier, preferred water levels of 4 to 18 inches are ideal for most dabbling ducks and Canada geese. Shallow water along the edges of these ponds will attract plovers, snipe, sandpipers, and other shorebirds that prefer water depths of 2 inches or less. Slightly deeper water (3 to 5 inches) will attract herons, rails, coots, bitterns, gallinules, and other wading birds. Coots and diving ducks like to feed in water about 20 inches deep. These deeper water areas are also attractive to muskrats and beavers.

Dry sites, with thick cover next to wetlands, will be used by white-tailed deer, turkey, quail, woodcock, squirrel, opossum, raccoon and other wildlife. Predators, including foxes, coyotes, bald eagles, hawks, and owls, will be attracted to these areas because of the abundance of prey species.

The way to achieve various water depths is correct timing and volume of water entering the wetland system. Moist soil management units should be flooded in the fall so food and water are available for the first arriving waterfowl (which is usually blue-winged teal and pintails). To achieve this result, water-control structures are closed in late summer or early fall, so by late fall the desired water level will be reached. This optimal level of flooding is maintained throughout the winter months.

Moist Soil Management: Spring Drawdown

Managers utilizing moist soil management techniques usually try to time the release of water (called **spring drawdown**) during the spring to encourage germination of wetland plants valuable to waterfowl and other wetland wildlife species. This is accomplished by opening the water-control structures. Spring drawdown should occur slowly. The best way is to release water in two stages or more. While shallow waters created by the drawdown are preferred by shorebirds, holding some deeper water creates habitat for wading birds. Spring drawdown also provides an important source of food (insects, crayfish, invertebrates, and other small animals) for wildlife. Spring water levels should be about 2 to 6 inches deep to promote plant germination and growth on exposed mud flats. Important wetland wildlife food plants are then allowed to grow and mature throughout the remainder of the spring and summer.

Moist Soil Management: Summer Management

As soon as native wetland plants have matured and produced seed, the area should be reflooded. If a landowner wishes to attract herons, rails, red-winged blackbirds, and resident waterfowl, 2 to 6 inches of water should be left in the impoundment. Many songbirds are attracted to the sites, as well as other species, such as northern harriers and other raptors.

Managing Flooded Woodlands for Waterfowl

Woodlands and bottomland forests can also be managed for waterfowl as greentree reservoirs. A greentree reservoir is a forested bottomland which is temporarily flooded during the fall and winter to attract waterfowl (particularly mallards and wood ducks). Hardwood trees are not killed by winter flooding when the trees are dormant. Most of these wetlands are made and flooded by the construction of levees with water-control structures. Flooding these areas to a depth of 1 to 18 inches allows waterfowl to access fallen acorns and other seeds. The main requirements for creating this type of wetland include:

1) *Impervious clay soils* that have good water holding potential.

2) *A minimum of 1 to 2 acres* (preferably larger than 10) in relatively flat country where a dam can be placed to create water depths of 1 to 18 inches.

3) *A large number of mast-producing trees* such as cherrybark, water, willow, swamp chestnut, and laurel oak or bald cypress, elm, maple, buttonbush, and tupelo gum that are at least 40 years old. Ash, elm, and maple are not good hard-mast-producing trees during the fall, but their winged seeds are an important late winter food source for waterfowl when other foods are not available.

4) *A dependable water supply*. Water sources may be a small stream, a water reservoir that is uphill from the site, a nearby pond, or a groundwater well.

A greentree reservoir works much like a moist soil management unit. In the fall, water-control structures are closed to impound water after trees are dormant. The water is retained on the site until late winter. Water should not be held on the area after tree buds begin to swell because the trees may be killed or stressed. In addition, attention should be given to the number of consecutive years that greentree reservoirs are flooded. Research has shown that 20 or more years of annual winter flooding will alter the composition of the forest in the greentree reservoir. Valuable mast-producing species will be replaced by flood-tolerant trees such as bald cypress, water tupelo and water hickory. One method of avoiding or slowing this change is to flood the greentree every other year, or in 2 out of 3 years. It could also be possible to slow the change by flooding at different times during late fall and early winter and drawing the water down in stages. This would mimic the natural pulsing or rise and fall of the flood water that would have occurred naturally.

During the summer, timber management in forest stands can improve the areas' value for waterfowl. The forest stands can be thinned or selectively harvested to remove undesirable trees and promote the growth of good mast-producing trees. A timber harvest should leave about 80 square feet of basal area of the best tree species. Trees left should be 14 to 30 inches diameter at breast height. A variety of different tree species should be left, because no single tree species will produce mast every year. A few standing dead trees should be left for wood duck nesting sites or wood duck nesting boxes should be installed. Half-acre to one-acre openings should also be created. These openings can be managed for active plants, or seeded to corn, sorghum, millets, or other crops to provide additional food for wintering waterfowl.

The Clemson Beaver Pond Leveler

Another method of managing wetlands for wildlife is to build and install a Clemson Beaver Pond Leveler in established beaver ponds. The device consists of a perforated PVC pipe that is encased in heavy gauge hog wire. This part is placed upstream of the dam, in the main run or deepest part of the stream. It is connected to non-perforated sections of PVC pipe which run through the dam to a water control structure downstream. It works because the beavers cannot hear the sound of falling water as the pond drains; therefore, they don't try to plug up the pipe. Once drained, the pond can then be managed as a moist-soil management area. For more information about the Clemson Beaver Pond Leveler, obtain a copy of the circular AFW #1 The Clemson Beaver Pond Leveler from the website http://dprod4.clemson.edu/olos/asp/searchmain.asp. A video of how to construct and install the device can also be ordered from the website www.clemson.edu/cafls/departments/forestry/fnr_store.html.

Wetland and Forest Restoration

The benefits of bottomland hardwood reforestation are numerous, and extend far beyond the short-term government incentives. According to the National Wetlands Research Center, bottomland hardwood forests can support 2 to 5 times as many wildlife species as nearby upland forests. When flooded, they attract waterfowl and provide food and spawning sites for several species of fish. For landowners, supplemental income by leasing hunting and fishing opportunities is an important economic benefit. Long-term timber production is another benefit of reforestation.